How to Break the Bandwidth Blues

by Kevin M. Savetz

You can't afford to wait. Your 28.8 kbps modem has taken you are far as it can go, and you're ready to move on to something faster. There are a variety of technologies which can help you do away with the bandwidth blues: each offers unique advantages—and special problems. Some are proven technologies, and others are barely out of the starting gate. Here we'll take a look at the choices and the issues involved in raising your Internet speed limit.

***33.6 kbps modem

It is the least expensive option for breaking the 28.8 barrier is a 33.6 kbps modem, which can send and receive data 16% faster than 28.8.

*How it Works

33.6 kbps modems work almost exactly like 28.8 kbps modems do: they convert digital data to an analog signal for transmission across a phone line. On the receiving end, another modem translates the analog sound back to digital bits. 33.6 kbps modems simply use a slightly faster transmission protocol to do their work.

Unlike the other technologies listed here, a 33.6 modem will work with the same phone lines, the same wall jacks, the same "twisted pairs" of copper wire that your slower modem uses. This means no hassles getting new lines; you can just use the phone service you've already got.

*How to Get it

To get cruising at this speed, you'll need a 33.6 kbps modem, and so will your Internet service provider, preferably from the same manufacturer. Ask your ISP if they offer 33.6 access, and if so, what brand of modem do they use?

If you already have a 28.8 modem, you may be able to upgrade your modem to 33.6 at little or no cost. Contact your modem's manufacturer or check their Web page: you may be able to download a flash ROM upgrade or order a replacement chip to do the upgrade yourself.

*How much it costs

If you already have a 28.8 modem, you may be able to upgrade your modem to 33.6 at little or no cost. Contact your modem's manufacturer or check their Web page: you may be able to download a flash ROM upgrade or order a replacement chip to do the upgrade yourself. Upgrading with flash ROM is extremely simple—just run a special program that updates the modem's internal software (called firmware.) On the other hand, a chip upgrade involves opening your modem's case and replacing a part yourself. (It may sound scary, but it's not difficult.)

If the company says that your modem really does max. out at 28.8, they may give you a discount on a brand new one. (Supra, for example, will replace your older 28.8 modem with a 33.6 one for about $75. If you are lucky to have a later version of that modem, you can download a firmware upgrade for free.)

Modems slower than 28.8 cannot be upgraded to 33.6. If you don't yet have a 28.8 kbps modem, you'll definitely have to buy a 33.6 to get the speed boost. A new 33.6 modem, such as the U.S. Robotics Sportster, will cost you around $250. Internet service providers generally do not charge extra for access at 33.6 kbps.

*Caveats/Vapor Factor

In reality, the speed increase over a 28.8 kbps modem is negligible. 33.6 kbps is 16% faster than 28.8 kbps. Although this speed boost is better than a sharp stick in the eye, it doesn't feel that much faster than 28.8 when you're online. The jump from 9600 to 14.4 kbps took modems 50%

faster, and from 14.4 to 28.8 was a doubling in speed. By comparison, 16% just isn't that much of a difference.

Have you ever noticed that your 28.8 modem doesn't always connect at top speed, even when connecting to a comparable modem? This may be due to noise on the phone lines, and the faster your modem is talking, the less tolerance there is for noise. Your phone connection simply may not be able to eke out the quality for a reliable 33.6 connection. If your phone conversations have static on the line, or your modem connections are plagued by on-screen garbage or unexpected disconnects, you may have noisy lines.

***ISDN

ISDN stands for Integrated Service Digital Network, and is tech speak for "way fast phone lines." Actually, ISDN is more than that: unlike traditional phone lines, ISDN transmits information as digital data, not analog. As a result, ISDN can offer access speeds up to 128 kbps—4 1/2 times the speed of that ever-lagging 28.8 modem.

*How it Works

ISDN works a lot like a traditional phone line. In fact, it uses the wiring that's already in your home or office. However, the phone company will perform extensive testing and "conditioning" of your lines to make sure they can carry a signal that is clear enough for ISDN.

To get your computer talking with ISDN, throw away that modem: it won't do. You'll need an "ISDN router." The router works a like a digital modem, moving bits between your computer and your Internet provider's. If your router supports it, you'll be able to toggle between 64 kbps and 128 kbps—slower for e-mail and telnet sessions, but full speed for Web access and marathon FTP sessions. At 128 kbps, your data can move at four times faster than with a 28.8 modem, definitely a good clip (Using 64 kbps will be slightly less expensive if your phone company charges per minute for ISDN access.)

*How to Get it

Besides a router, you'll also need an Internet service provider that provides ISDN access—check first, although ISDN is growing in popularity, many ISPs don't yet offer ISDN access. Your phone company must also provide ISDN service to your home.

Although ISDN is growing in popularity, many ISPs don't yet offer ISDN access. Your phone company must also provide ISDN service to your home.

*How much it costs

ISDN can be expensive, but not prohibitively so. The cost depends on three highly variable factors: the price of your ISDN router, the Internet service provider fee, and the telephone company's charge. A router that can connect a single computer to the Internet will cost from $350 to $500. (The Motorola Bitsurfer Pro has a street price of about $389.) ISDN can also be a good choice if you need to connect a small LAN to the Internet: a router that is able to connect several computers at once can cost from $1000-$1500, such as the Ascend Pipeline 25.

Check with your local Internet service provider about fees—costs for ISDN access are all over the board. Rates range from $25 a month for all-you-can-eat access, to pay-as-you-go at $5 an hour. The industry simply hasn't settled on a typical price range for ISDN. You'll need to call your telephone company about fees—every phone company has its own idea of what ISDN is worth. Pacific Bell charges about $35 per month for home ISDN access, plus a penny a minute when you're connected during business hours (even if you are making a local call.)

*Caveats/Vapor Factor

ISDN is a very real technology, but it may not be available to you if your telephone company or Internet provider aren't with the program yet. Even if your phone company does offer access, you won't be able to get ISDN access if your site is located too far away from the phone company's switching equipment.

If you have the choice, try to get the same brand of router that your Internet provider uses. It is not essential, but you may be able to utilize extra features, such as compression, if you do. (This may be impossible: many ISPs have industrial-strength ISDN routers that don't come in home versions.) ISDN routers, like modern modems, can use compression to pack more data onto the line, giving an effective throughput of faster than 128 kbps. This works well with highly compressible data, like text, but does little good with data that is already compressed, like GIF and ZIP files.

Although most phone companies offer up to 128 kbps with ISDN, some max. out at 112 kbps due to technical limitations of their switching equipment.

Finally, some people are wary of investing in ISDN because it may be "leapfrogged" by faster technologies like ADSL and cable modems. This remains to be seen, but the fact is that ISDN is a reliable, widely available tool now, while some other technologies are either not ready for prime time or too expensive for home users and small businesses

***ADSL

ADSL stands for Asymmetric Digital Subscriber Line, an emerging technology that is getting a lot of press—and hype. When receiving data, ADSL is 52 to 139 times faster than 28.8. ADSL is slower when sending data, at 2 to 17 times the speed of a modem.

*How it Works

ADSL is the phone company's answer to cable modems: it provides ultra-fast data transfer. Depending on the type of ADSL system used, the service can transfer data downstream (to the user) at 1.5 to 4 megabits per second, and upstream (from the user) at 64 to 500 kilobits per

second. Because of its lopsided transmission rates, ADSL may be an excellent choice for those who need to receive a lot of data, but not send huge amounts. This means it would not be practical to run a popular Web site over ADSL.

ADSL works over existing phone wires, and like ISDN, ADSL requires special equipment, a special connection to the phone company and an Internet provider that can feed the data.

There are an estimated 560 million copper telephone wires installed around the globe, but traditional phone service uses only 1% of the bandwidth the wires can hold. ADSL uses a different form of modulation to squeeze more information on a traditional phone line than is possible with standard voice calls and analog modems.

*How to Get it

Here's the problem—unless you are lucky enough to live in one of a few areas where phone companies are doing ADSL trials, you can't get it today. Systems are still being tested and the protocols are still being argued about. Some industry execs believe that ADSL will be available in many cities by the end of the year or early next near. This may be highly optimistic—more likely, it will be 9 months to a year before ADSL is readily available. GTE is conducting the industry's first ADSL trial for Internet access in the Dallas-Fort Worth area. Other phone companies are following: Bell Atlantic Corp., BellSouth Corp., SBC Communications Inc. and U S West have also announced ADSL trials. Metropolitan cities will be the first with ADSL access.

*How much it costs

Prices for ADSL routers will range from $500 to $2,000 depending on maximum speed and configuration. Installation of the ADSL line could be a major hurdle, at an estimated $3000. All of this new equipment is currently in very short supply, so prices should drop considerably in a few months as ADSL becomes more common.

The monthly service fee to the phone company will be low—likely a flat a fee under $50. The cost to the Internet service provider will likely be much higher—some ISPs only have 1.5 megabits per second to share between all their analog modem customers, so they will need to invest big bucks to upgrade their bandwidth and equipment. Indeed, most ISPs may stay out of ADSL altogether, leaving it to the phone companies to provide Internet access in addition to the line itself.

*Caveats/Vapor Factor

ADSL has promise, and although you may be ready for it despite its high startup cost, ADSL is not ready for you. ADSL won't disappear into the vapor, but it will be a few more months, maybe a year, before it congeals into a service that we can really use.

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***Cable Modem

If you have cable television, you're already downloading hundreds of thousands of megabits of data every second in television signals. Wouldn't it be nice to harness some of that bandwidth to access the Internet? Cable modems can theoretically deliver data at up to 350 times the speed of a 28.8 modem—but in reality, you aren't likely to have all that speed to yourself.

*How it Works

In order to offer Internet access via the same wire that your television signals travel on, your cable company allocates part of its bandwidth (enough to carry a TV channel or two) to Internet packets. The cable company broadcasts incoming Internet packets to everyone, but unlike a TV. signal, which can be seen by anyone who is tuned to that channel, each Internet packet has an address which assures only its intended recipient will see it. (Your cable modem actually receives packets destined for all users in your area, but only accepts packets meant for you. This may cause concern to those of us who don't want others snooping on our Internet habits.)

Cable modems can provide up to 10 megabits per second of downstream ac-

cess. Depending on the equipment you use, you will be able to hook a cable modem to your computer, or directly to your television set so you can surf the Web using a special remote control.

*How to Get it

To get it, just call your cable company and say "I want cable access to the Internet." Then hold your breath for a long, long time. Today, cable Internet access is mostly in the testing stage. Although some cable companies are farther along than others, none are yet offering Internet access to everyone who can get HBO and MTV.

*How much it costs

Industry execs expect that cable modems will cost around $300. It is probable that when your cable company offers Internet access, it will rent the modem to you—or even loan it to you for free. The cost of Internet service is up to the cable company—expect no more than $30 a month for all-you-want access. Since the cable company will provide the Internet feed, there is no need for a separate service provider.

*Caveats/Vapor Factor

Cable Internet access is still vaporware. If it proves to work reliably, it will revolutionize how we access and use the Internet. But there are other caveats.

Unlike ADSL, ISDN and analog modems, cable Internet access is a shared resource. You don't get 10 megabits per second to yourself: you share it with the cable customers on several nearby blocks. If every cable customer logs in to the Net at once (not likely) your access speed will slow to a crawl. If you're the only one online (again, not likely) you get the bandwidth to yourself. For most uses, 10 MBPS is more than enough to share with a few of your neighbors.

Sending data over cable isn't as easy as receiving it. Upstream data tends to attenuate as it travels to the cable company, getting lost under the stronger downstream television signals. Some companies believe they can deal with the problem, offering slower upstream access (like ADSL does.) Others will skirt the issue by offering a hybrid system—incoming data comes via cable, but outgoing data travels on your phone line via a traditional modem built in to the cable box. For web browsing and news reading, this situation may work nicely, although it does tie up your phone while you are online.

*Fractional T-1/T-1/T-3

If you're ready for a full-time connection that can send and receive data at a hare's pace, you may need a T-1, fractional T-1, or T-3 Internet connection. A T-1 line offers 1.544 megabits per second, more than 50 times the speed of a 28.8 kbps modem, and a T-3 will give you a blistering 44.7 megabits per second—28 times faster than a T-1. A fractional T-1 is a slice of a T-1 that can deliver from 56 kbps to the top speed of 1.544 megabits per second.

*How it Works

T-1s and T-3s are very fast dedicated circuits that move information between two points. They are useful for companies that need to have 24-hour Internet access with a lot of bandwidth. As you no doubt expect by now, you'll need special equipment, including a router and a CSU/DSU (Channel Service Unit/Digital Service Unit).

High-speed dedicated access is expensive and complicated to set up and maintain, but it is a proven technology. If you need to run your own Internet servers, this is the way to go.

*How to Get it

Your phone company provides T-1 and T-3 service today, and many ISPs provide dedicated Internet feeds. You will probably need an experienced consultant to help you sort out the hardware choices, or perhaps your service provider will help you with those decisions.

*How much it costs

Once again, your cost will vary considerably depending on your phone company, Internet provider and speed needs. Here's a guideline: T-1 access is really expensive, and T-3 access costs are in the stratosphere. A T-1 line from Pacific Bell costs about $1,000 to set up plus around $700 a month. High-speed Internet service from a reputable provider costs an additional $3000 to set up and $1,500 each month.

*Caveats/Vapor Factor

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I asked six Internet trendsetters for their opinions: What technology will emerge as the leading broadband solution and when can home consumers expect to reap its benefits?

Avram Miller

VP Business Development, Intel

I don't think there will be a single solution - I think the two leading solutions will be cable modems and ADSL. My guess is that it will be evenly divided between the two. 20 to 30% of the PC homes in the United States will have broadband capability by the end of the decade, by the combination of those two. I think satellite technology will play am important role in the US, but because of its late start, satellite won't play a dominant role in the US.

Expanded to the rest of the world, wireless solutions for broadband access will be the predominate method. In Asia, China, India, the developing markets, satellite communications will be very prevalent. With very large populations, the communications infrastructure to reach all those people in a wired way will be very expensive. Satellites will preclude cable.

The good news is that someday in the future - certainly in the U.S. - we will have a choice of how we will receive information.

John S. Quarterman

Editor, Matrix Maps Quarterly and Matrix News, *http://www.mids.org.*

ISDN is currently the most popular. It might not seem a lot faster than 28.8, but a reliable factor of two is as much as 28.8 over 14.4. And ISDN has much less latency than any modem, plus very fast redial. It's somewhat surprising that ISDN languished for years with little use, until you think, who would you have called with it? It really had no application before the Internet. Now it does.

Cable modems are an interesting idea, but to my knowledge no cable company has yet mastered both sufficient manufacturing capacity for the cable modems and the logistics of deploying them. Presumably some of them will get their act together eventually.

I'd bet on ADSL as a more widespread solution, however.

Mike O'Dell

VP and Chief Scientist, UUNET Technologies, Inc.

There probably won't be just one, assuming there are any. It's not at all clear that "fast connections" will ever be "cheap connections", at least not in the way many folks are dreaming about. Does the phrase "Power too cheap to meter" ring a bell? How about "Free, unlimited bandwidth"?

Bill Gram-Reefer

President, WORLDVIEW

ISDN is DOA. Pac Bell's plan is to use cable modems where its fiber backbone is installed and ADSL modems over copper in other areas until the fiber shows up. It will be mix and match to get the job done, although ADSL has advantage until cable companies get more two-way cable installed.

David Hakala

Managing editor, Boardwatch Magazine

Cable. 18 months.

Reason one: it's going to be the fastest solution of the ones currently proposed. Two: cable companies very badly want a piece of the Internet action. Three: they are more competent than the RBOC's [regional phone companies.] The @Home cable service is already being market tested. ADSL still isn't anywhere and 33.6 does not work over normal phone lines. It is not viable. You get a 16% increase about 10% of the time.

Robert Metcalfe

Executive Correspondent, InfoWorld and VP Technology, International Data Group

The *important* thing about cable modems, ADSL, ISDN, etc. is not technological, but that *competition* be unleashed among them and other technologies, which means we have to de-monopolize telecommunications. Allowing telcos to buy one another and to buy cable companies is *not* what we need, and should be stopped. ISDN is our best short term solution beyond 28.8, and look how the telco monopolies have botched that for the last 20 years.

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